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**Hill et al.**

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(54) **SYSTEMS AND METHOD FOR PROVIDING A GRAPHITE LAYER IN AN ELECTRONIC DEVICE**

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**H05K 9/00** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H05K 9/0032** (2013.01); **H05K 7/20481** (2013.01)  
USPC ..... **361/719**; 361/818

(58) **Field of Classification Search**  
None  
See application file for complete search history.

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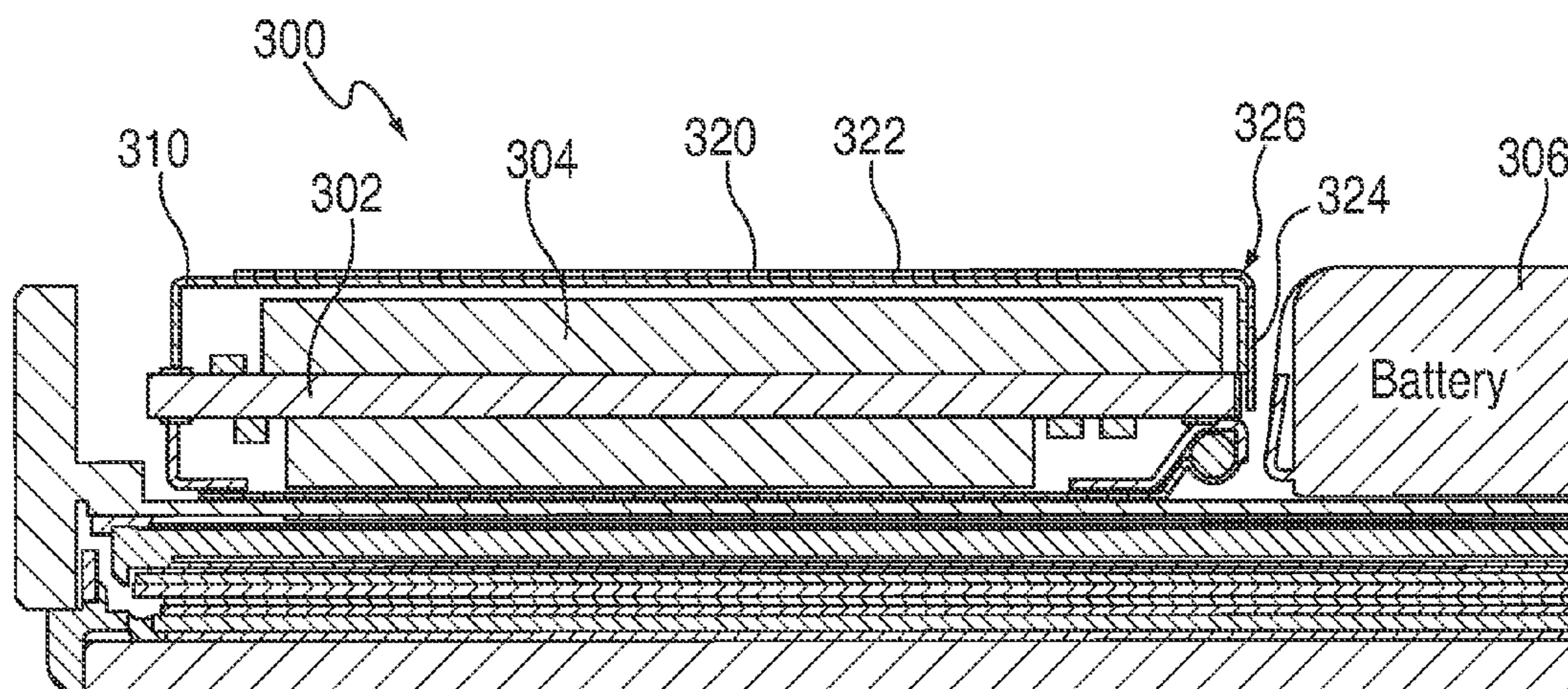
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Primary Examiner — Gregory Thompson

(57) **ABSTRACT**

Systems and methods are provided for a sheet of graphite material on an electromagnetic interference shield for enhanced heat transfer. An electronic device component may be enclosed by an EMI shield, which may retain heat generated by the component. To help dissipate heat, a sheet of material selected for its heat transfer properties may be disposed over the EMI shield. A portion of the sheet may be folded over an edge of the EMI shield such that the sheet may cover a top surface of the sheet as well as tabs extending perpendicular to the top surface of the EMI shield. To facilitate the adhesion of the sheet to a smaller surface area of tabs, the sheet may include features forming a discontinuity in regions of the sheet aligned with the edge of the shield to facilitate folding the sheet. The discontinuity can include, for example, one or more holes or windows.

**20 Claims, 9 Drawing Sheets**



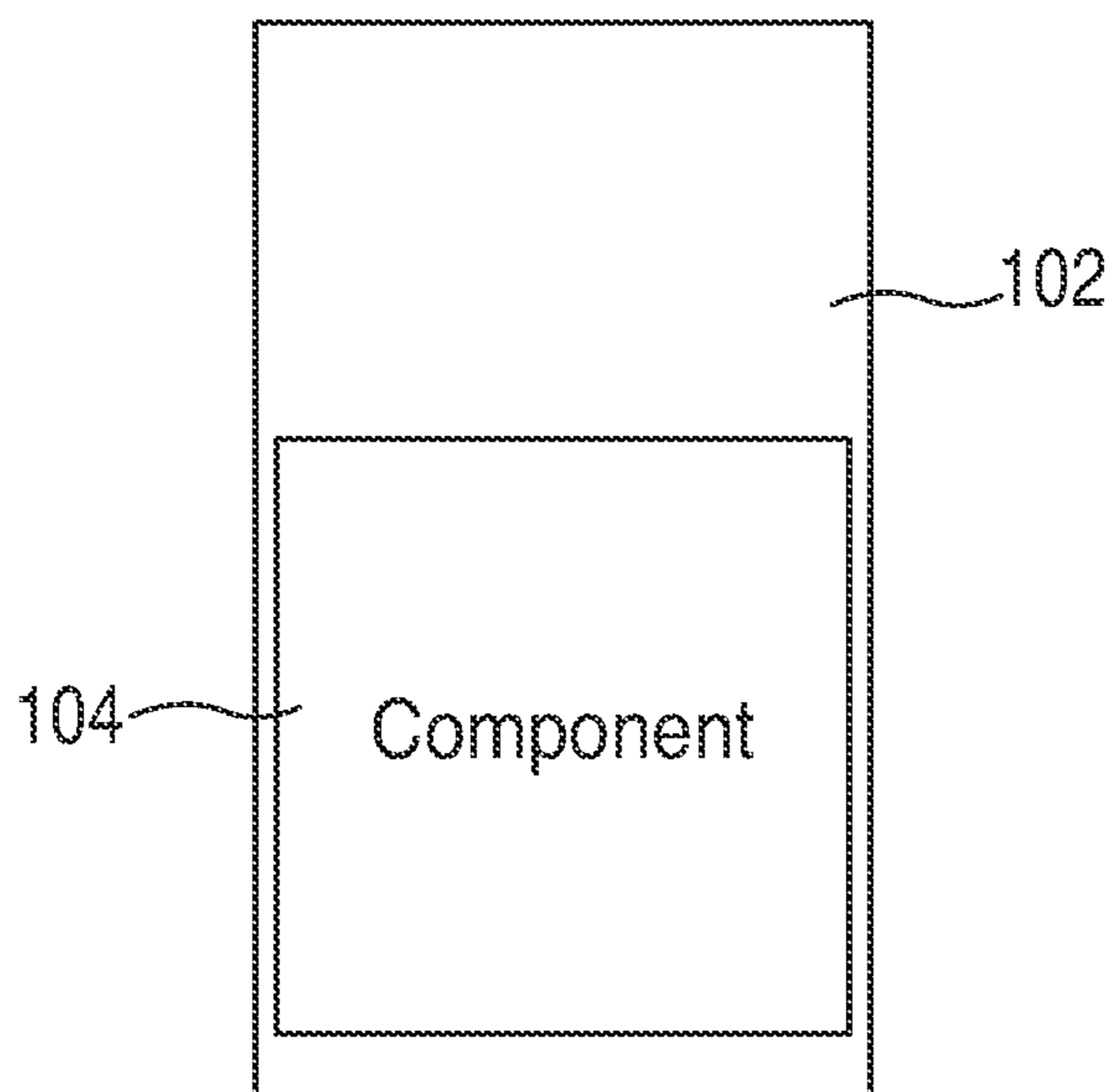


FIG. 1

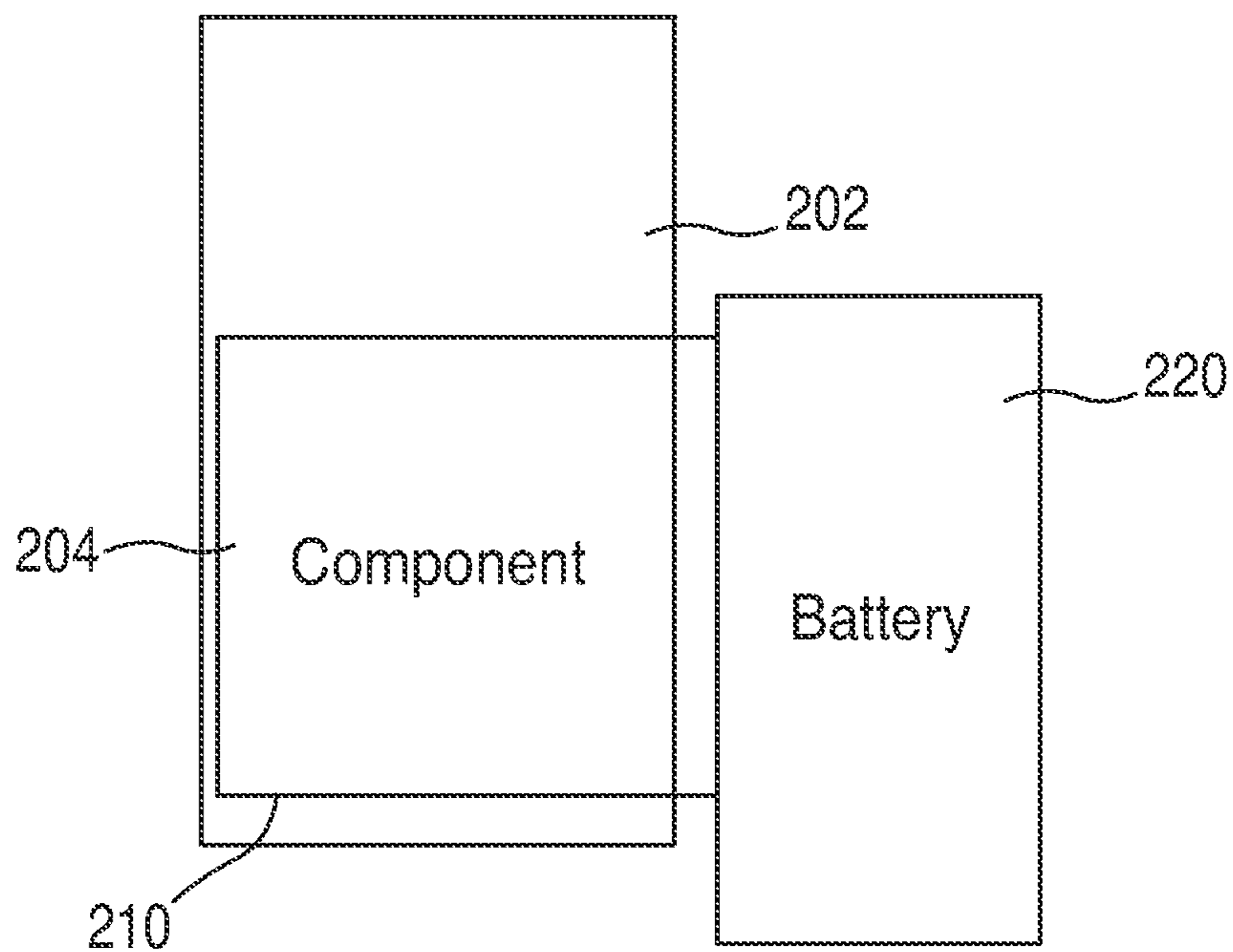


FIG. 2

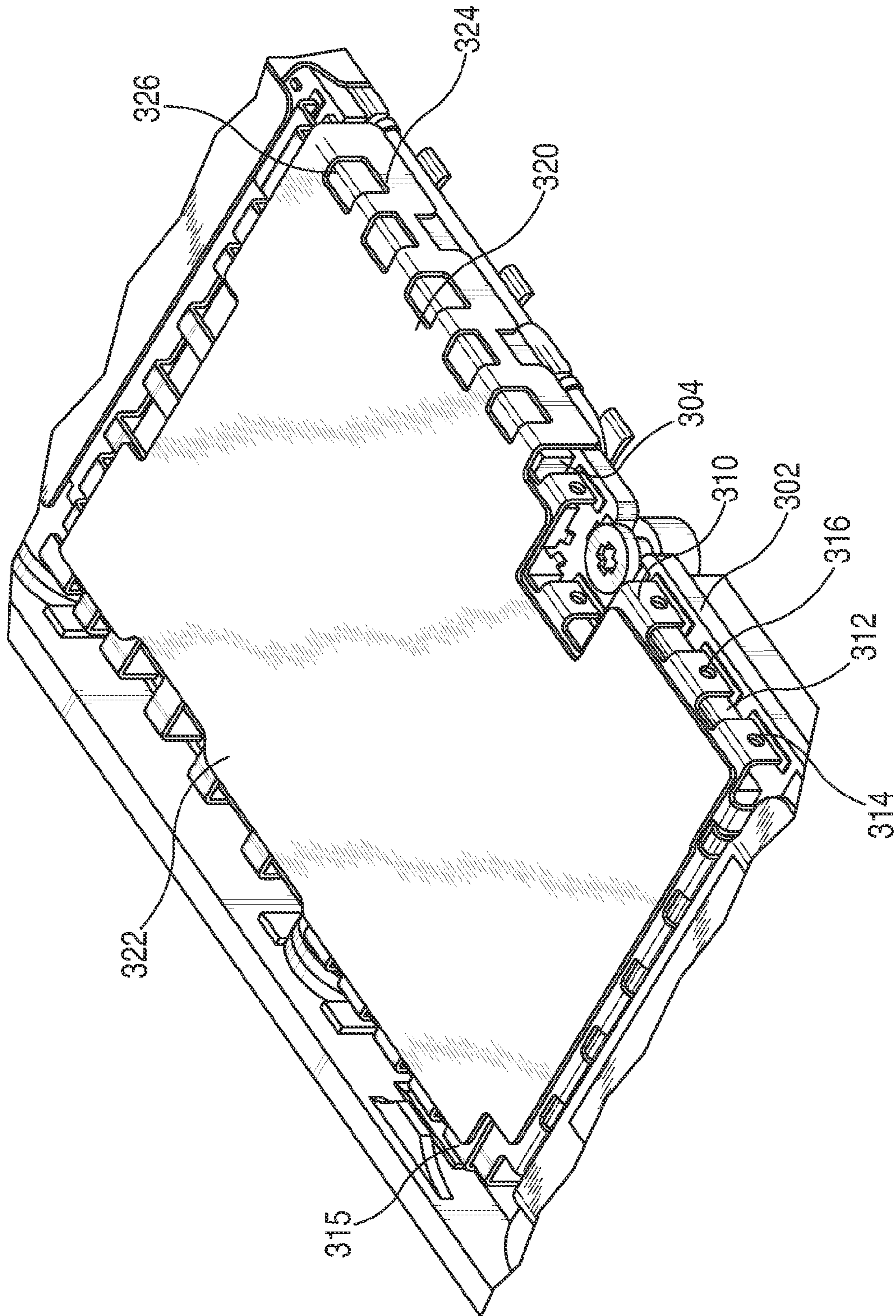


FIG. 3

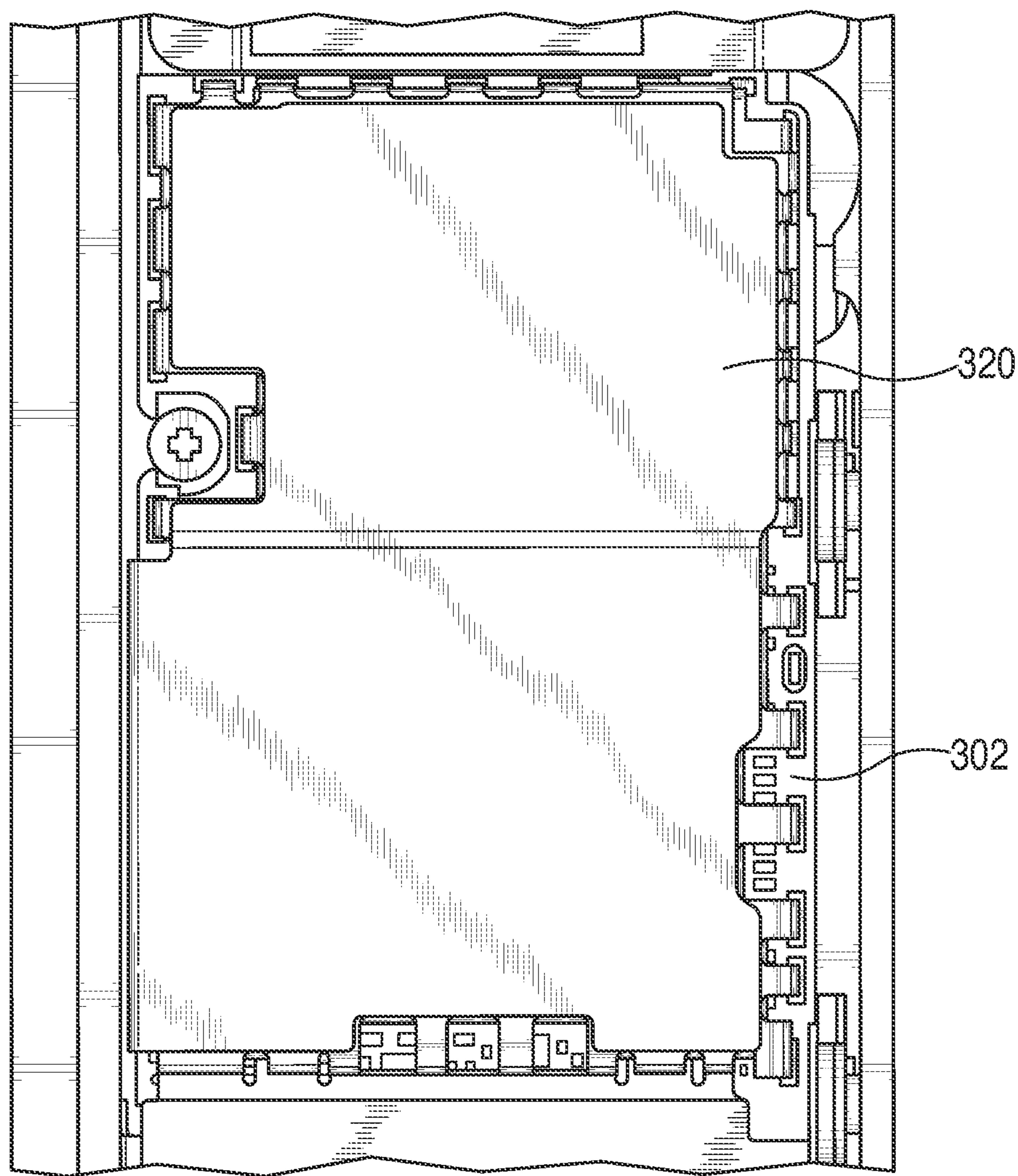


FIG. 4

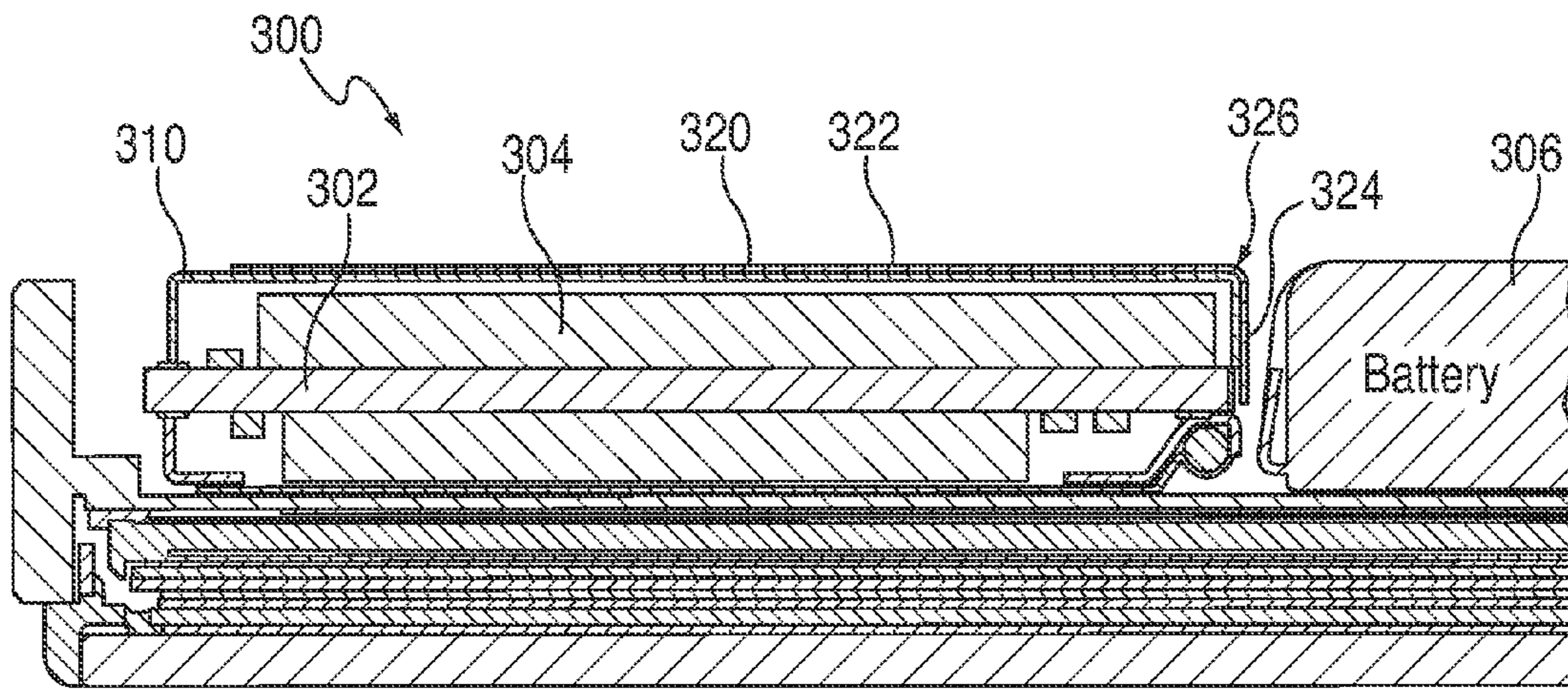


FIG. 5

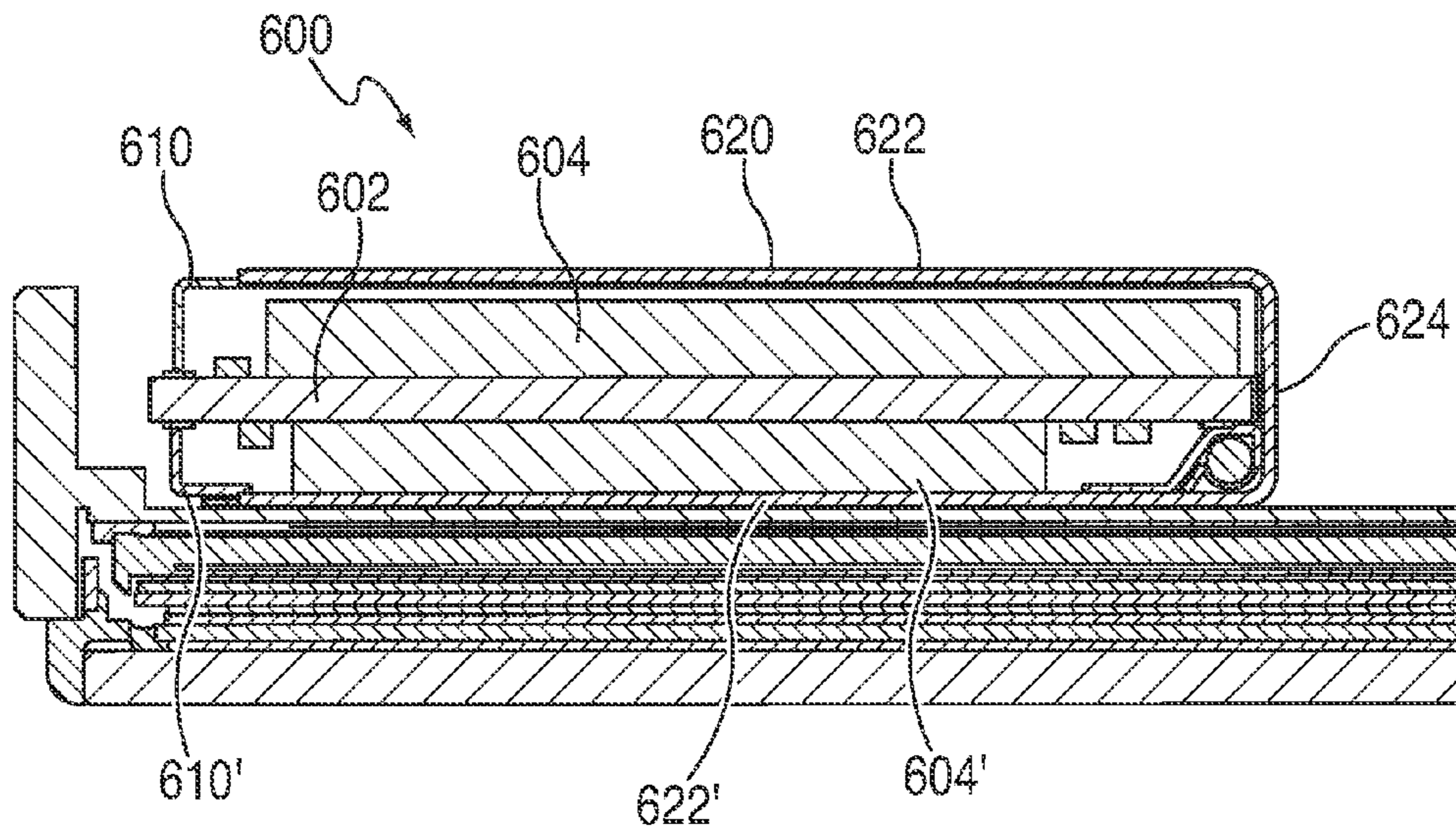


FIG. 6A

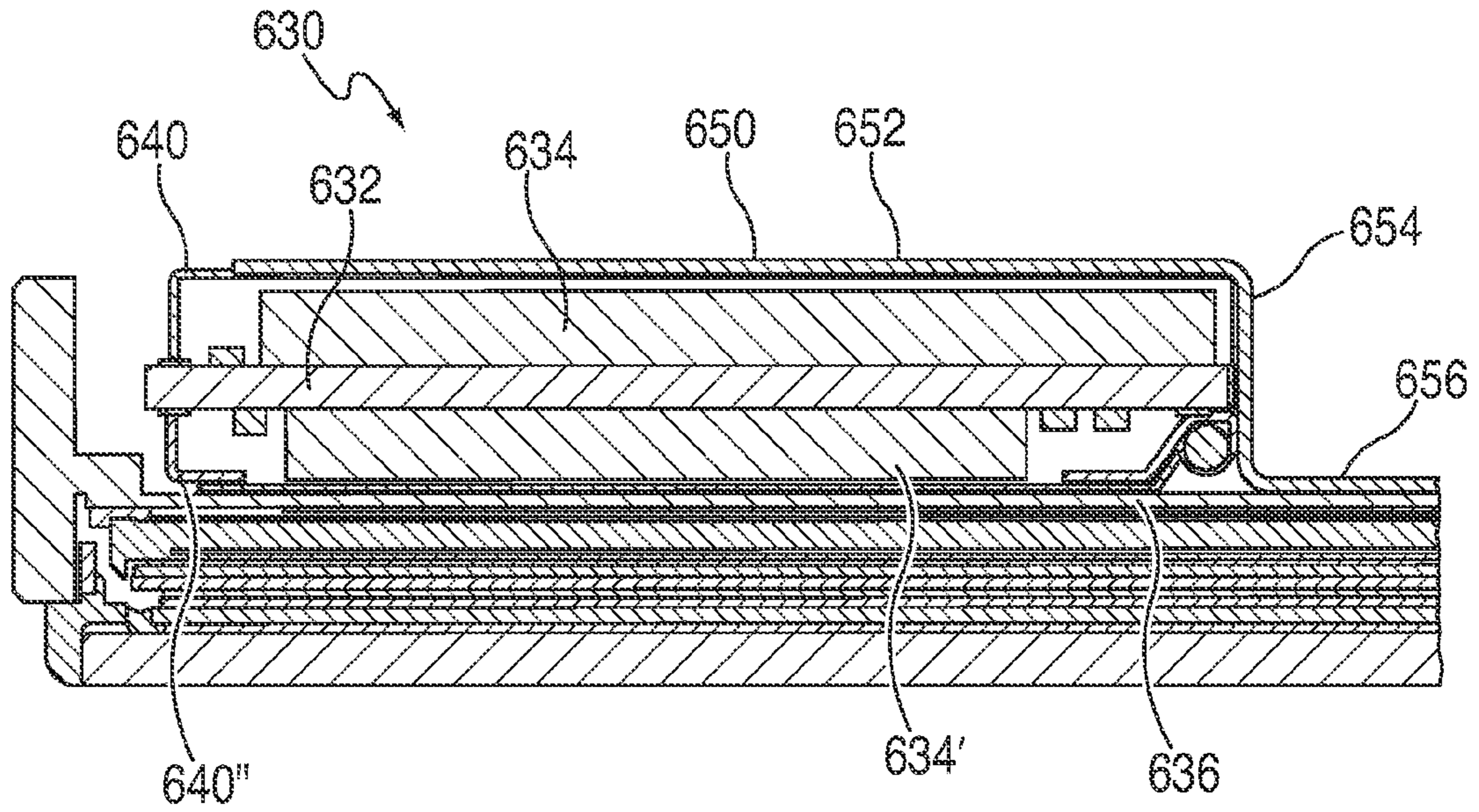


FIG. 6B

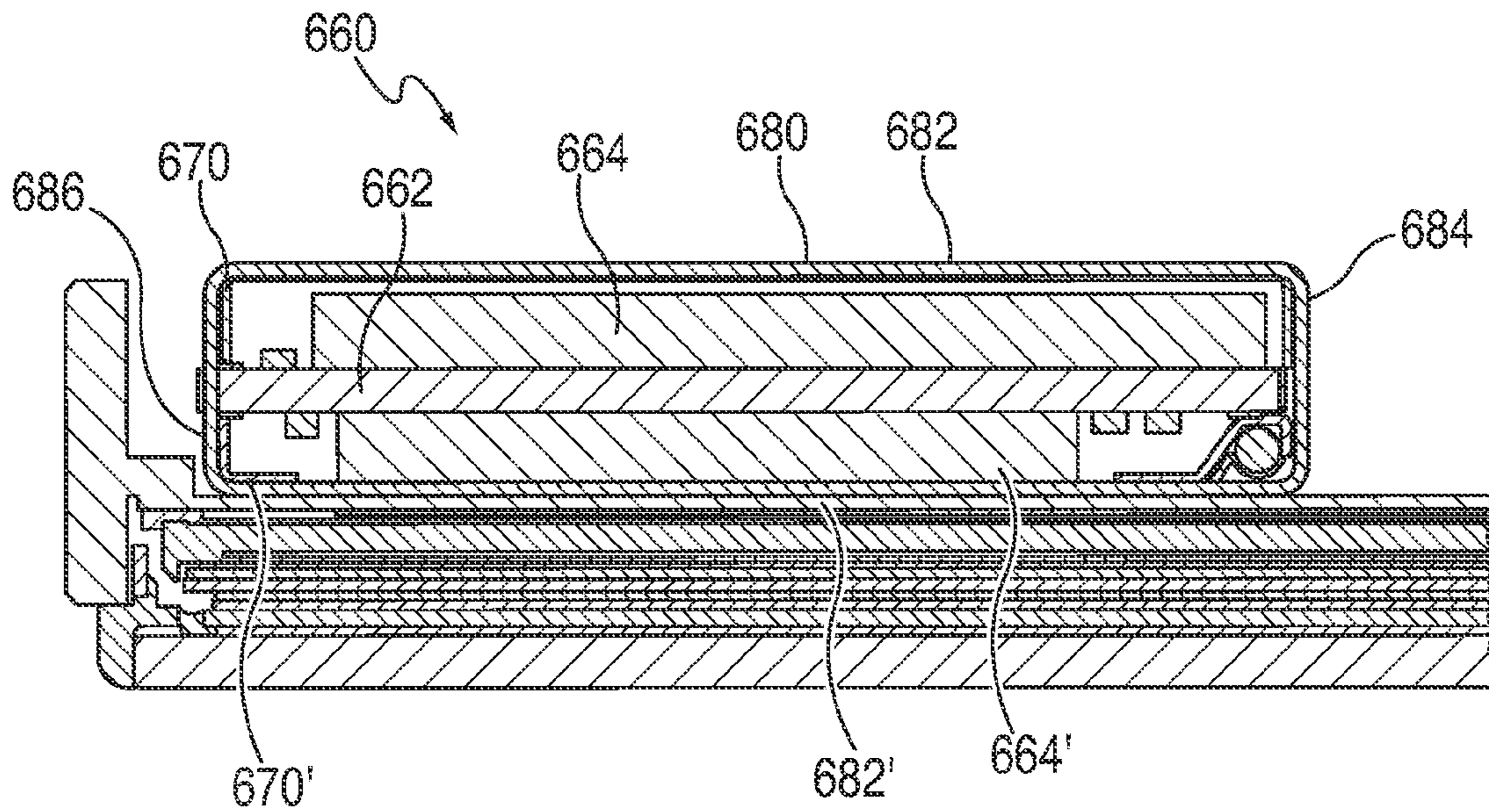


FIG. 6C

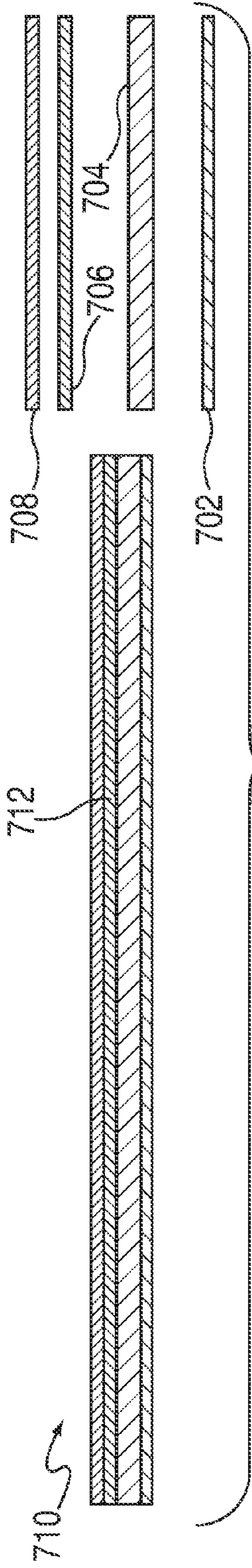


FIG. 7A

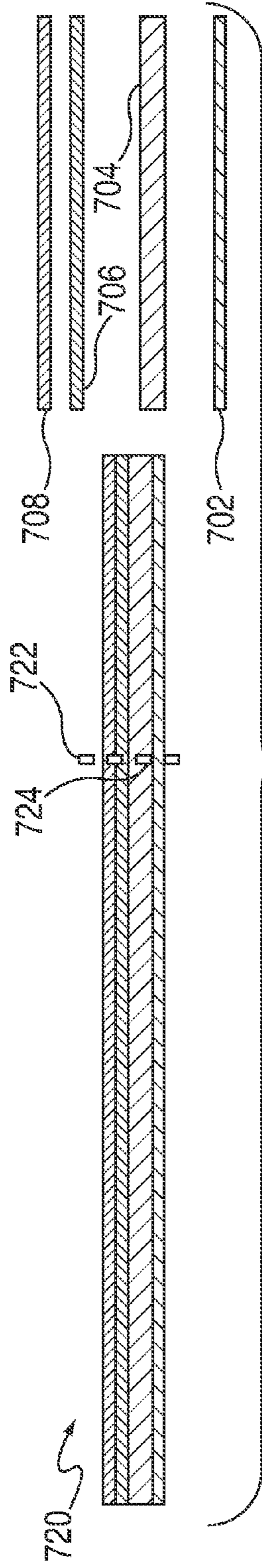


FIG. 7B

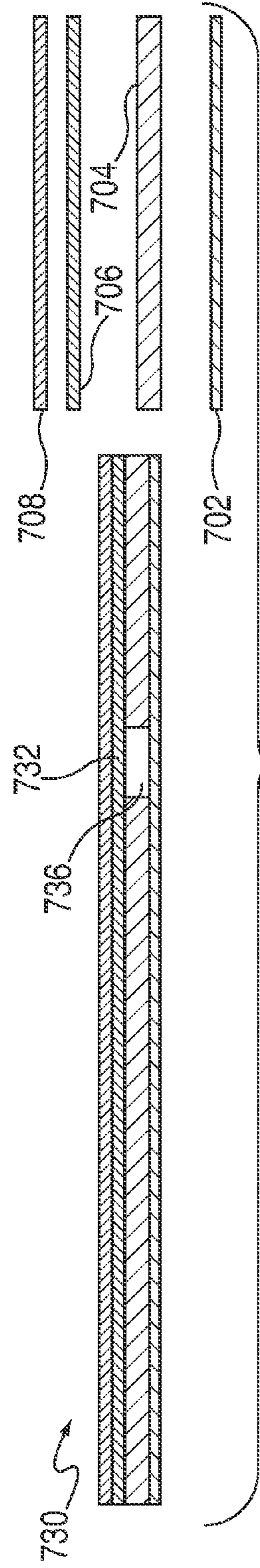


FIG. 7C

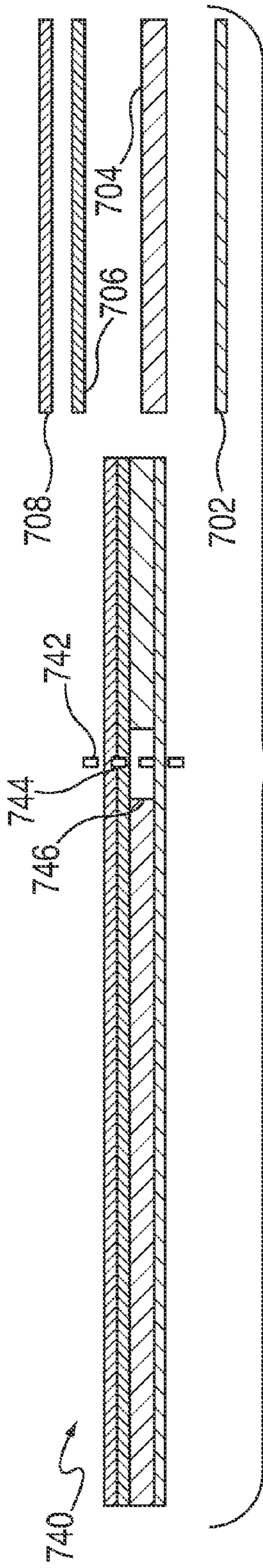


FIG. 7D

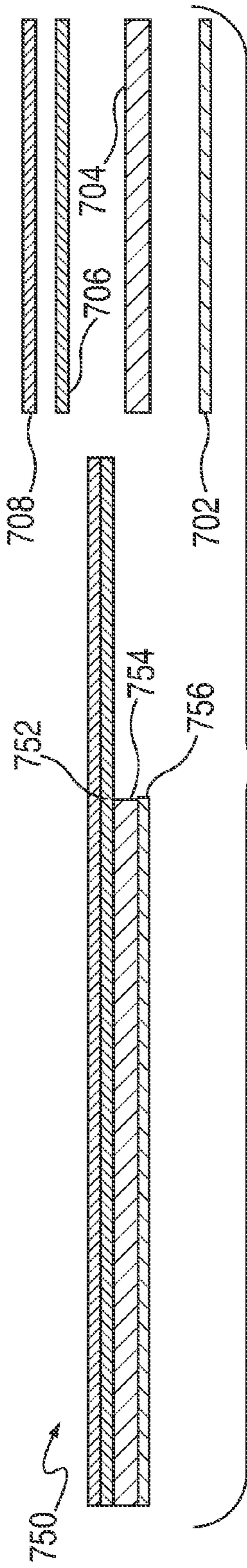


FIG. 7E

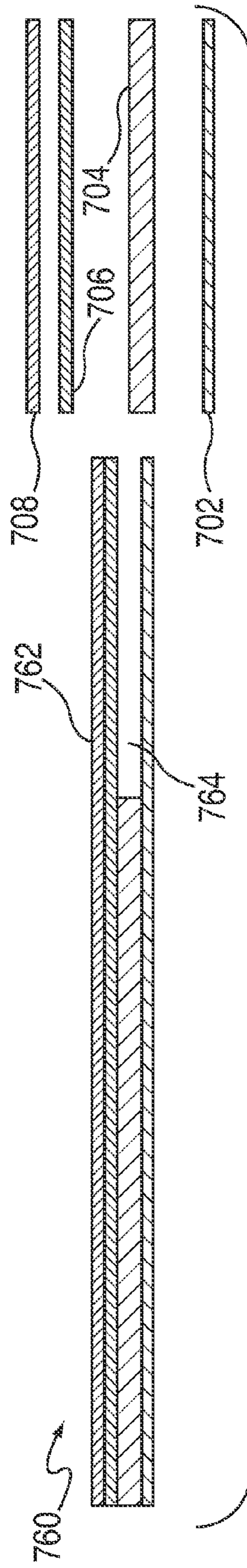


FIG. 7F



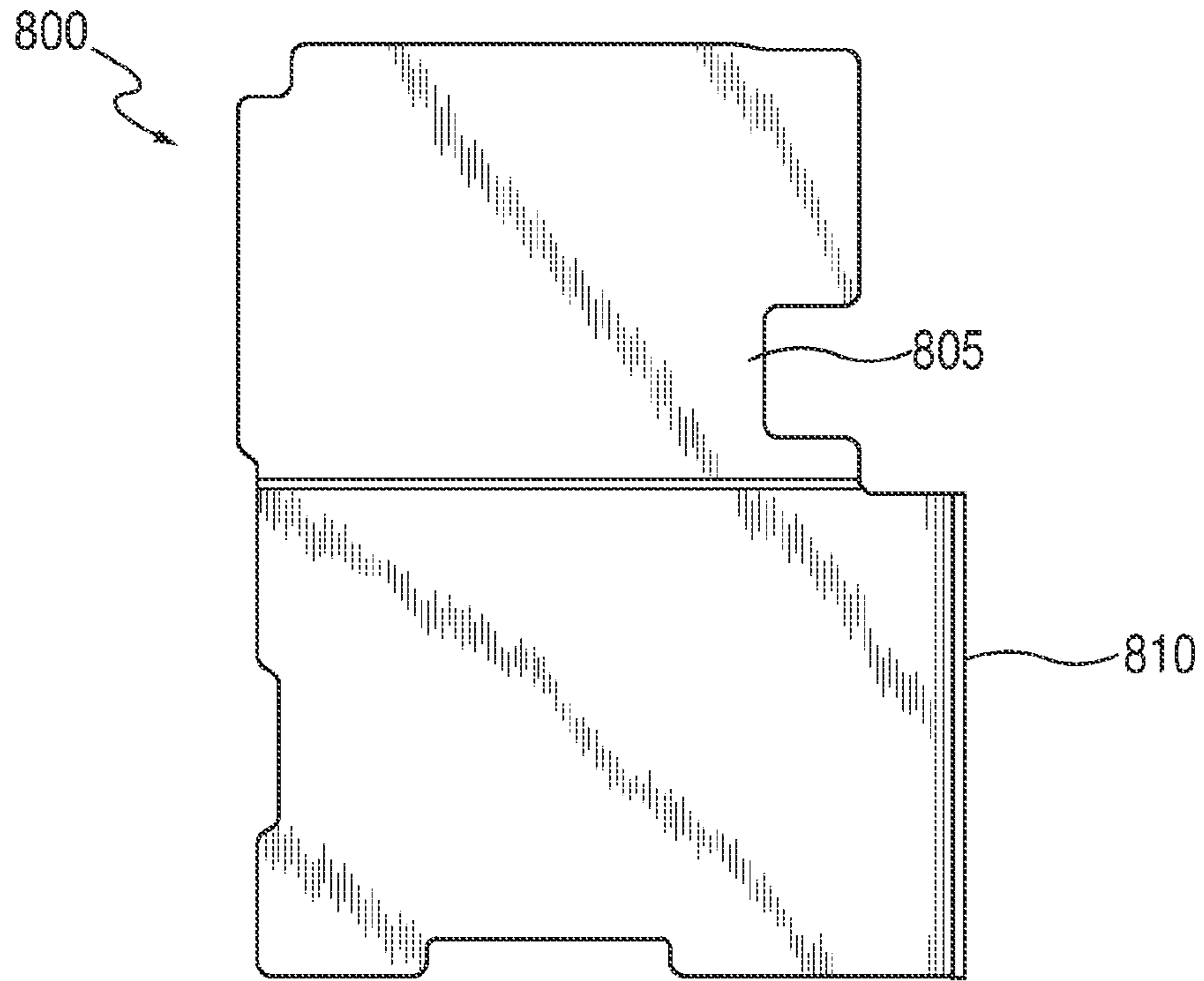


FIG. 8

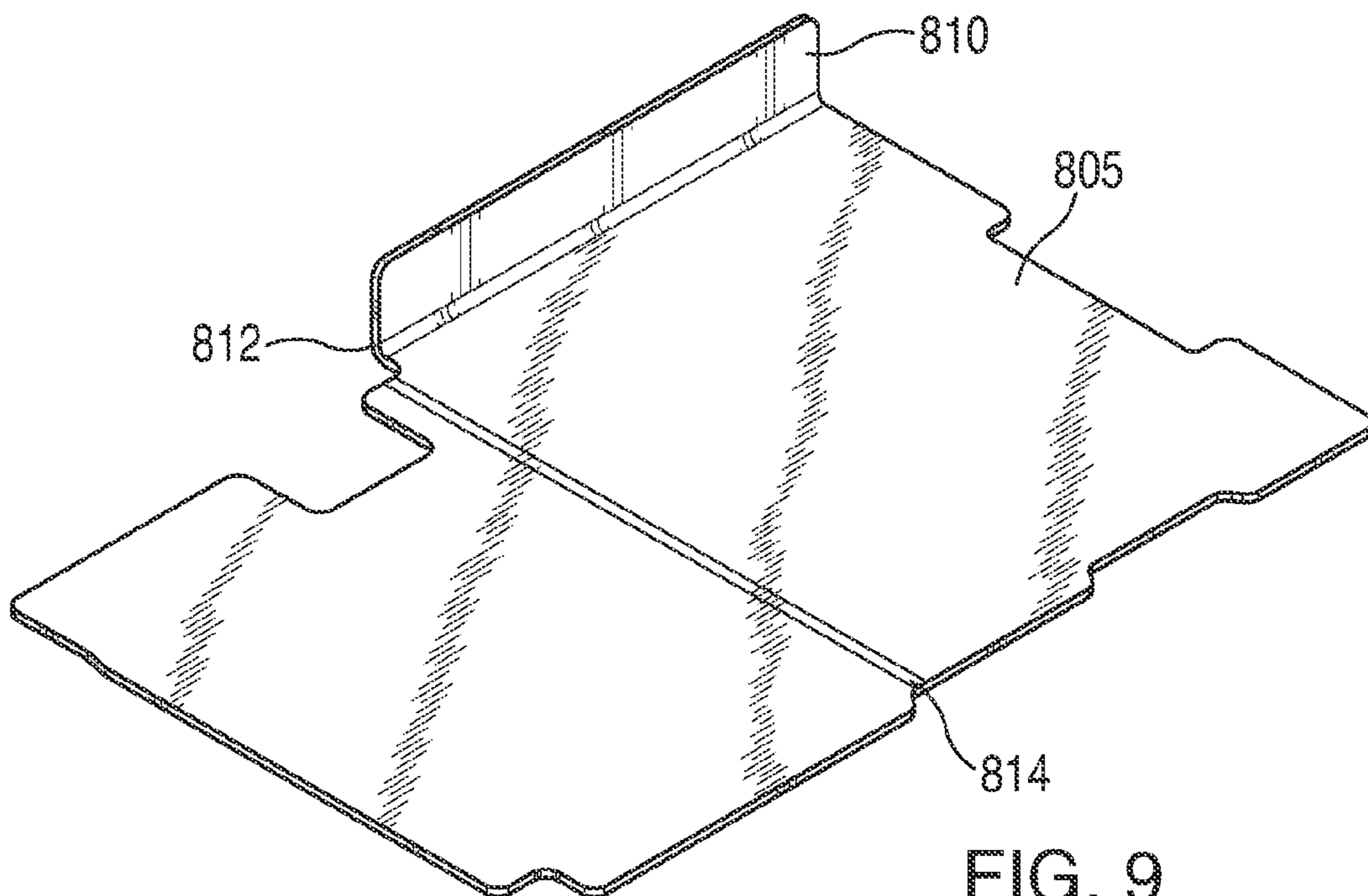


FIG. 9

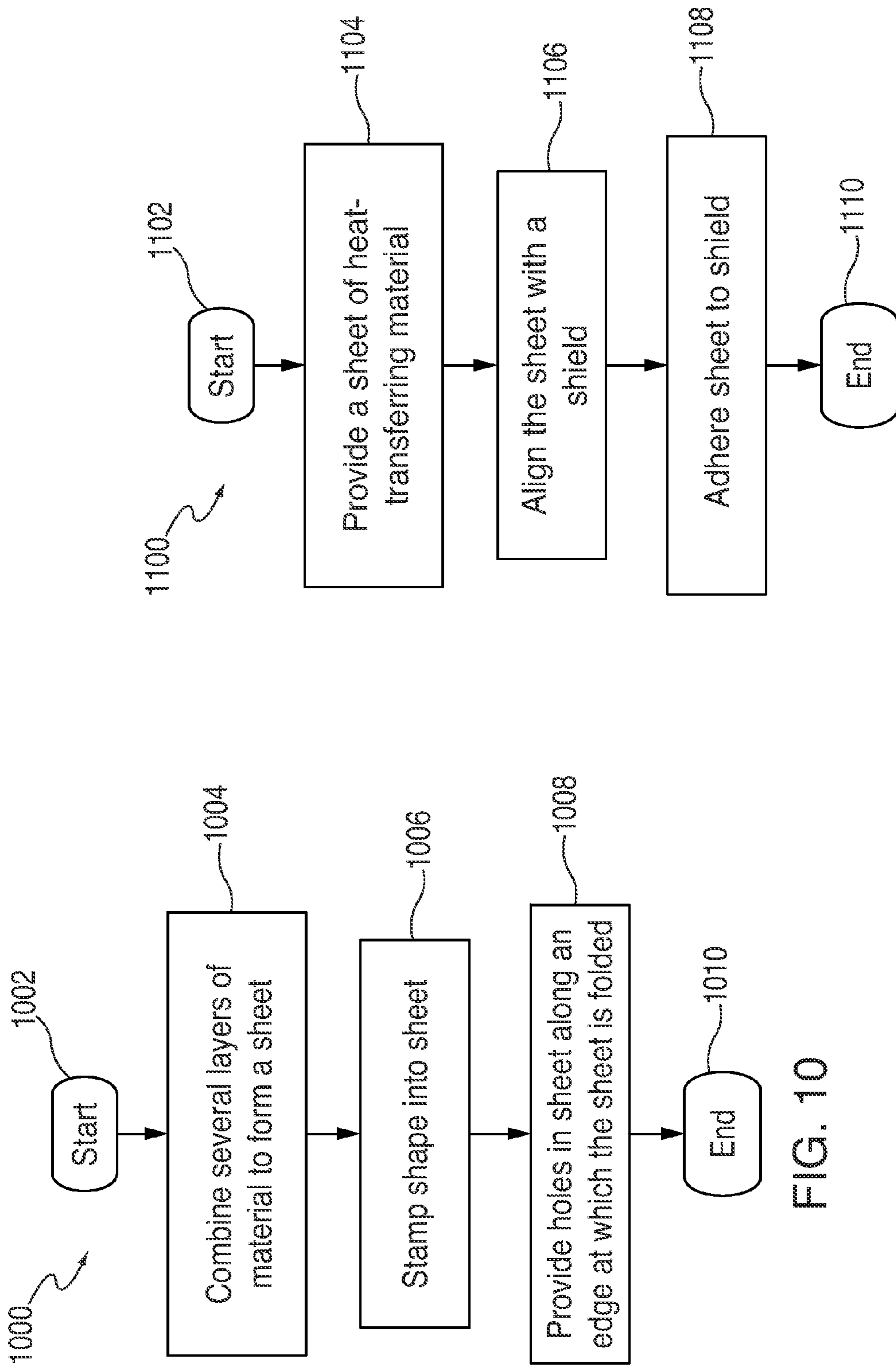


FIG. 10

FIG. 11

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## SYSTEMS AND METHOD FOR PROVIDING A GRAPHITE LAYER IN AN ELECTRONIC DEVICE

### BACKGROUND OF THE INVENTION

Electronic devices include several electronic components used to process and transmit electrical signals. During use, some components may generate electromagnetic waves that may interfere with the proper operation of other components. To prevent electromagnetic interference (EMI), the electronic device can include one or more EMI shields placed over the components. The shields can be constructed, for example, from stamped sheet metal forming a box that is clipped over the components.

During use, electronic device components may also generate heat that must be dissipated to ensure proper operation of the components. Placing an EMI shield over a component, however, may reduce the ability of the components to dissipate heat. To improve the heat dissipation of a shielded component, a sheet of heat conducting material can be placed on a top surface of the EMI shield.

### SUMMARY OF THE INVENTION

This is directed to systems and methods for providing a graphite layer in an electronic device for enhancing heat transfer.

An electronic device component may be shielded from EMI using a shield placed over the component. The shield can be constructed, for example, from a piece of sheet metal having a planar or top surface from which side walls or tabs extend. Heat generated by the component may be in part trapped by the shield. To help dissipate the generated heat, a sheet of graphite material may be coupled to the shield. In some cases, the sheet can include several layers of different material that are coupled to each other.

The sheet may be disposed such that a portion of the sheet is coupled to the top surface and another portion of the sheet is coupled to the tabs. Because the sheet may include a fold over the edge of the shield, the sheet may include a discontinuity that facilitates the fold and enhances adhesion to the smaller surface area of the tabs. The discontinuity may include, for example, one or more holes, windows, openings, or entirely or partially empty or unfilled layer of material within the sheet.

### BRIEF DESCRIPTION OF THE FIGURES

The above and other objects and advantages of the invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

FIG. 1 is a schematic view of an illustrative circuit board and component in accordance with some embodiments of the invention;

FIG. 2 is a schematic view of an illustrative circuit board and component over which a shield is placed in accordance with some embodiments of the invention;

FIG. 3 is a perspective view of an illustrative circuit board and component over which a shield is placed in accordance with some embodiments of the invention;

FIG. 4 is a top view of the illustrative circuit board and component over which a shield is placed of FIG. 3 in accordance with some embodiments of the invention;

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FIG. 5 is a sectional view of the component, shield, and material shown in FIGS. 3 and 4 in accordance with some embodiments of the invention;

FIGS. 6A-6C are sectional views of an illustrative electronic device each having a component and a shield over which material is provided in accordance with some embodiments of the invention;

FIGS. 7A-7F are sectional views of illustrative sheets of material for use in accordance with some embodiments of the invention;

FIG. 8 is a perspective view of a sheet of material that may be adhered to a shield in accordance with some embodiments of the invention;

FIG. 9 is a top view of a three-dimensional disposition of the sheet of material of FIG. 8 in accordance with some embodiments of the invention;

FIG. 10 is a flowchart of an illustrative process for constructing a sheet of material for transferring heat from a shield of a component in accordance with some embodiments of the invention; and

FIG. 11 is a flowchart of an illustrative process for adhering a sheet to a shield in accordance with some embodiments of the invention.

### DETAILED DESCRIPTION OF THE INVENTION

An electronic device can include a circuit board on which one or more electronic device components are placed. FIG. 1 is a schematic view of an illustrative circuit board and component in accordance with some embodiments of the invention. As shown, component 104 is mounted to circuit board 102. For example, component 104 can be mounted by soldering, surface mount technology (SMT), a conductive adhesive, or using any other suitable approach. Circuit board 102 can include any suitable type of board or circuit on which components can be mounted. For example, circuit board 102 can include a printed circuit board, flex circuit, or any other type of circuit. Component 104 can include any suitable type of electrical component such as, for example, a processor, controller, signal processor, communications module, or any other component coupled to a circuit board.

Some components may generate electromagnetic waves during use. These waves may propagate within the device and interfere with the proper functioning of other components. To prevent this, individual components can be shielded using an EMI shield. The EMI shield can be constructed from a conductive element such as a metal lid placed over the component. The lid can be secured within the electronic device using any suitable approach. In some cases, the lid can engage a fence that is secured to the circuit board around the component. Alternatively, the lid can be secured directly to the circuit board.

FIG. 2 is a schematic view of an illustrative circuit board and component over which a shield is placed in accordance with some embodiments of the invention. Circuit board 202 and component 204 can have some or all of the features of the circuit board 102 and component 104 (FIG. 1), respectively. To shield component 204 from EMI, shield 210 can be placed over component 204. Shield 210 can include a lid portion having a planar top surface that is placed adjacent to a surface of component 204 that is co-planar with a surface of circuit board 202. To secure shield 210 over component 204, shield 210 can include side walls (not shown) extending substantially perpendicular from the top surface. The side walls may engage a frame extending from circuit board 202, for example using an interference fit, or via dimples or other features.

Different components can be provided near component **204** and shield **210**. For example, another circuit board and component(s) can be placed adjacent to circuit board **202**. As another example, a stand alone component such as a battery can be placed near component **204** and shield **210**. In the particular example of FIG. 2, battery **220** can be placed adjacent to circuit board **202** such that battery **220** is near shield **210**.

More detailed views of a board assembly having an EMI shield covered by a heat transfer material in accordance with embodiments of the invention are provided in FIGS. 3 and 4. In particular, FIG. 3 is a perspective view of an illustrative board assembly and FIG. 4 is a top view of the same board assembly. As shown, component **304** is mounted to circuit board **302**, and EMI shield **310** is mounted over component **304**. Also shown, is heat transfer material **320** disposed on EMI shield **310**.

EMI shield **310** can be constructed from one or more distinct elements. For example, EMI shield **310** can include fence **312** forming a wall extending perpendicular to a surface of circuit board **302**. Fence **312** can be secured to circuit board **302** using any suitable approach including, for example, using soldering. Fence **312** can include one or more segments disposed around the periphery of component **304**. The segments may be substantially continuous, and include a height that is similar to the height of component **304**. For example, fence **312** may have a height that is the same height as or marginally higher than the height of component **304**. In some cases, fence **312** may surround several components mounted to circuit board **302**.

To complete EMI shield **310**, lid **314** can be placed over fence **312** such that lid **314** engages fence **312**. Lid **314** can include planar surface **315** sized to correspond to the area enclosed by fence **312**. Lid **314** can also include tabs **316** extending substantially perpendicular from planar surface **315** such that tabs **316** may engage fence **312** to secure lid **314** to fence **312**. Lid **314** can include any suitable number of tabs extending from surface **315**. For example, lid **314** can include tabs placed apart by less than a maximum amount (e.g., no more than 3 mm separate tabs). In some cases, one or both of tabs **316** and fence **312** can include features for securing lid **314** to fence **312**. For example, each tab **316** can include a dimple that extends into a hole or opening of fence **312**.

Lid **314** can be constructed using any suitable approach. In some cases, lid **314** can be constructed from a piece of sheet metal that is stamped. As a result of the stamping process, tabs **316** can have sharp edges. When other components placed adjacent to lid **314** move or are jostled, for example, during a drop event, the other components may come into contact with tabs **316** and be damaged. If the other components include a battery module that has a relatively small outer shell (e.g., only a Mylar sheet) due to space constraints, the tabs may damage the battery should the battery come into contact with the tabs during a drop event. Accordingly, it may be desirable to provide an additional barrier along the edges of tabs **316**.

In addition, component **304** may generate heat during use. Because component **304** is enclosed by EMI shield **310**, and lid **314** is constructed from a metal, the heat generated by component **304** may be retained adjacent to component **304** and adversely affect the performance of component **304**. Different approaches can be used to enhance the heat transfer capabilities of the shield. In some cases, a layer of material selected for its heat transferring capabilities may be placed in contact with EMI shield **310** such that heat generated by component **304** may be transferred from EMI shield **310** and the layer of material away from component **304**.

Any suitable type of material may be used to transfer heat away from component **304**. For example, the material can include a carbon allotrope such as graphite, graphene, diamond, amorphous carbon, fullerenes, carbon nanotubes, carbon nanobuds, glassy carbon, carbon nanofoam, lonsdaleite, or other carbon allotrope. In some cases, other types of material can be used such as, for example, metals, composite materials, or other material that enables the transfer of heat.

Material may be disposed over any suitable portion of EMI shield **310** to form part of a board assembly. In some cases, some material may be provided on external portions of fence **312**. Such an approach, however, may not be preferable as external portions of fence **312** may be placed in contact with tabs **316**, which may adversely affect or even negate the heat transfer benefits of the material.

In some cases, the material may instead or in addition be provided on lid **314**. For example, a sheet of material may be placed on planar surface **315**. As another example, one or more sheets of material may be placed on tabs **316** disposed along each edge of planar surface **315**. Each sheet of material may be secured to a portion of lid **314** using any suitable approach including, for example, an adhesive. Because the surface area of tabs **316** may be relatively small (e.g., due to the small height of component **304**), it may be difficult to adhere material to the tabs. In such cases, it may be simpler to provide material only on planar surface **315**.

In other cases, however, a same piece of material may be used to cover different regions of lid **314**. For example, as shown in FIGS. 3 and 4, material **320** may be disposed over lid **314** such that portion **322** of material **320** is disposed over planar surface **315** and portion **324** of material **320** is disposed over tabs **316**. The material may include a fold at an edge of planar surface **315** so that the same piece of material may extend over different planes of lid **314**. In particular, material **320** may include a 90 degree fold **326**.

FIG. 5 is an illustrative sectional view of the board assembly of FIGS. 3 and 4 in accordance with some embodiments of the invention. To enhance thermal conduction and heat dissipation, material **320** may be disposed over shield **310**, such that portion **322** of the material is overlaid on a planar surface of shield **310** and portion **324** of the material is overlaid on a tab of shield **310**. Material **320** may include fold **326** corresponding to a boundary between portions **322** and **324** of the material, and that is aligned with an edge of shield **310**.

In addition, the disposition of material **320** may provide additional mechanical benefits within the assembly of electronic device **300**. As discussed above, shield **310** may include a lid having stamped tabs. Due to the stamping process, the tabs may have sharp edges that could cut other components that potentially come into contact with the tabs. Should the tabs of shield **310** come into contact with other components of electronic device such as, for example, battery **306**, an outer shell of battery **306** may be damaged, which may in turn could damage the internal components of battery **306**. By placing material **320** over the tabs of shield **310**, electronic device **300** may provide a barrier between shield **310** and other components of the device.

The material may be disposed over or around the shield using any suitable approach. FIGS. 6A-6C are sectional views of illustrative board assemblies each having a component and a shield over which material is provided in accordance with some embodiments of the invention. Board assembly **600**, shown in FIG. 6A, can include component **604** mounted to circuit board **602**. Shield **610** may be placed over component **604** such that the component is enclosed within a volume defined by circuit board **602** and shield **610**. In some cases, circuit board **602** can include a second component **604'**

coupled to a surface of circuit board **602** opposite the surface to which component **604** is coupled. Board assembly **600** can include a second shield **610'** coupled to circuit board **602** such that component **604'** is enclosed in a volume between circuit board **602** and shield **610'**. Component **604'** and shield **610'** can be aligned in any suitable manner relative to component **604** and shield **610**. In some cases, shields **610** and **610'** can be aligned relative to one another to form a box-like shape.

Board assembly **600** can include sheet of material **620** disposed over at least one of shields **610** and **610'** to enhance heat dissipation. In one implementation, sheet **620** can be disposed in a U-shaped cross-section such that portion **622** of sheet **620** is disposed on a top surface of shield **610**, portion **622'** of sheet **620** is disposed on a top surface of shield **610'**, and portion **624** of sheet **600** extends between portions **622** and **622'** along tabbed edges of the shields. In some cases, shields **610** and **610'** can be disposed such that the edges of each of shields **610** and **610'** form a substantially flat surface (e.g., a surface that extends in a single plane).

By providing a single piece of material extending between the top surfaces of shields **610** and **610'**, the portions of material **620** adjacent to the tabs or edges of the shields may remain secured to the shields despite the discontinuous nature of the tabs, or despite the smaller surface area of the tabs. In addition, by enclosing one or both of components **604** and **604'** within a volume enclosed by material **620**, material **620** may provide a barrier to water or other foreign particles that could damage components **604** and **604'**.

Board Assembly **630**, shown in FIG. **6B**, can include component **634** mounted to circuit board **632**. Shield **640** may be placed over component **634** such that the component is enclosed within a volume defined by circuit board **632** and shield **640**. In some cases, circuit board **632** can include a second component **634'** coupled to a surface of circuit board **632** opposite the surface to which component **634** is coupled, and can include a second shield **640'** coupled to circuit board **632** such that component **634'** is enclosed in a volume between circuit board **632** and shield **640'**. Component **634'** and shield **640'** can be aligned in any suitable manner relative to component **634** and shield **640**. In some cases, shields **640** and **640'** can be aligned relative to one another to form a box-like shape.

Sheet of material **650** may be disposed in part over shield **640** (e.g., portion **652** of material **650**) and over edge or tab portions of shield **640** and shield **640'** (e.g., portion **654** of material **650**). In addition, sheet of material **650** may include portion **656** extending in a plane substantially co-planar with a top surface of shield **640** and adhered to another component **636** of electronic device **600** such that sheet of material **650** forms a step. In this implementation, material **650** may form a barrier to prevent water or other contaminants from reaching components **634** and **634'**.

Board assembly **660**, shown in FIG. **6C**, can include component **664** mounted to circuit board **662**. Shield **670** may be placed over component **664** such that the component is enclosed within a volume defined by circuit board **662** and shield **670**. In some cases, circuit board **662** can include a second component **664'** coupled to a surface of circuit board **662** opposite the surface to which component **664** is coupled, and can include a second shield **670'** coupled to circuit board **662** such that component **664'** is enclosed in a volume between circuit board **662** and shield **670'**. Component **664'** and shield **670'** can be aligned in any suitable manner relative to component **664** and shield **670**. In some cases, shields **670** and **670'** can be aligned relative to one another to form a box-like shape.

Sheet of material **680** may be disposed in a manner similar to that of material **620** shown in FIG. **6A**. In particular, material **680** may include portions **682** and **682'** disposed adjacent to top surfaces of shields **670** and **670'**, respectively. Material **680** may also include portions **684** and **686** adjacent to edges of shields **670** and **670'** such that material **680** forms a closed loop around shields **670** and **670'**, thus enclosing components **664** and **664'** in a closed volume.

Each of the sheets of material shown in FIGS. **6A-6C** include at least one fold. Because of inherent stiffness, thickness, or other mechanical properties of the material, however, the sheet may resist bending and may peel up or adhere poorly on smaller surface areas (e.g., on tabs extending from a planar surface of a shield). Different approaches may therefore be used to provide a sheet of material to be placed on a surface of a shield in a device. In particular, different approaches may be used to create discontinuities in a sheet of material to facilitate bending. FIGS. **7A-7F** are sectional views of illustrative sheets of material for use in accordance with some embodiments of the invention.

Each sheet can include several layers having different properties. In particular, each sheet can include a first adhesive layer **702** for adhering the sheet to a shield. Adhesive layer **702** can include, for example, an adhesive or glue, hook and fastener material, tape, or any other material used for adhering components together. Adhesive layer **702** can have any suitable thickness. In some cases, the thickness of layer **702** can be the smallest thickness required to ensure that the sheet will adhere to an EMI shield.

After first adhesive layer **702**, each sheet can include heat-transferring layer **704**. For example, each sheet can include a layer having a thickness selected to provide a particular amount of heat transfer. In some cases, the thickness of layer **704** may be selected based on mechanical properties of the material. Layer **704** can be constructed from any material suitable for transferring heat away from a component. For example, layer **704** can be constructed from graphite, a metal, a composite material, or any other material operative to enable or enhance heat transfer.

Second adhesive layer **706** can be provided on a surface of layer **704** opposite the surface to which first adhesive layer **702** is provided. Second adhesive layer **706** may be constructed from the same material as layer **702**. Second adhesive layer **706** may have the same or different mechanical and structural attributes as first adhesive layer **702**. For example, second adhesive layer **706** may have a same thickness as first adhesive layer **702**.

An external layer **708** can be coupled to second adhesive layer **706** to provide an external surface or shell for each sheet. External layer **708** may be selected from a material having any desired mechanical attributes (e.g., resistance to abrasion, puncture, or impacts). External layer **708** can be constructed from any suitable material including, for example, Mylar®, PET, or any other plastic or composite material.

Different approaches can be used to ensure that the sheet of material will fold at an appropriate location. In some cases, the sheet of material can simply be folded without any modifications. Sheet **710**, shown in FIG. **7A**, may include no particular features for enabling a fold along line **712**. During assembly, sheet **710** may simply be forced to fold along line **712**, which may correspond to an edge in a shield over which sheet **710** is disposed.

Sheet **720**, shown in FIG. **7B**, may include several holes **724** provided through sheet **720** along line **722** to facilitate folding. Holes **724** may have any suitable shape or size. For example, holes **724** may include a regular or irregular pattern

or distribution of holes along a line or shape corresponding to a fold region of sheet 720. Each of holes 724 can include one or more of circular or elliptical holes, polygonal holes, slots, or any other type of opening extending through sheet 720. Holes 724 may be constructed using any suitable approach including, for example, by punching or stamping holes in sheet 720 (e.g., when sheet 720 is cut).

Sheet 730, shown in FIG. 7C, may include region 736 corresponding to line 732 in which a portion of heat-transferring layer 704 is removed (e.g., an opening or a window in sheet 730) to facilitate folding. Any suitable amount of layer 704 may be removed along line 732. For example, the entirety of layer 704 may be removed along line 732. Alternatively, region 736 may include several distinct windows or openings having the same or different sizes distributed along line 732. The windows may extend through any suitable amount of line 732 including, for example, any amount in the range of 25% to 75%, or more than 75%. The windows of region 736 can be constructed using any suitable approach including, for example, laying layer 704 in manner that has windows, or removing portions of layer 704 to form region 736.

Sheet 740, shown in FIG. 7D, may include holes 744 extending through sheet 740 along line 742, combined with region 746 in which a portion of heat-transferring layer 704 is removed along line 742. Holes 744 may include some or all of the features of holes 724 described above, and region 746 may include some or all of the features of region 736 described above. In particular, holes 744 may extend through sheet 740 in both regions where layer 704 is present and through regions where layer 704 is absent (e.g., region 746).

Sheet 750, shown in FIG. 7E, may include region 754 associated with layer 704 and region 756 associated with layer 702. In each of regions 754 and 756, the associated layers may be removed starting at line 752 and extending towards portions of sheet 750 that are not placed adjacent to a top surface of a shield. For example, layers 702 and 704 may be removed in regions of sheet 750 that are placed adjacent to a tab extending from a shield lid. The thinner portions of sheet 750 (e.g., portions having only layers 706 and 708) may then easily fold at line 752.

Sheet 760, shown in FIG. 7F, may include region 764 associated with layer 704. In region 764, the associated layer may be removed starting at line 762 and extending towards portions of sheet 760 that are not placed adjacent to a top surface of a shield. For example, layer 704 may be removed in regions of sheet 750 that are placed adjacent to a tab extending from a shield lid. The thinner portions of sheet 750 (e.g., portions having only layers 702, 706, and 708) may then easily fold at line 752.

FIG. 8 is a top view of a sheet of material that may be adhered to a shield in accordance with some embodiments of the invention. FIG. 9 is a perspective view of a three-dimensional disposition of the sheet of material of FIG. 8 in accordance with some embodiments of the invention. Sheet 800 can include a discontinuous or castellated border that corresponds to different features of the shield. For example, sheet 800 can include a border that matches the shape and dimensions of the shield. In addition, sheet 800 can include one or more tabs 810 that may fold out of primary surface 805 of sheet 800. For example, tab 810 may be in a plane perpendicular to a plane of primary surface 805 such that primary surface 805 may adhere to a top surface of a shield lid, and tab 810 may adhere to a tab or edge extending from the top surface of the shield lid. In some cases, sheet 800 can be shaped to correspond to discontinuities or variations in shape of the shield (e.g., step 814). To allow tab 810 to bend relative

to primary surface 805, sheet 800 can include a sequence of perforations or other feature along edge 812 that facilitates bending.

The following flowcharts describe illustrative processes that relate to the construction and use of heat-transferring sheet on a shield. FIG. 10 is a flowchart of an illustrative process for constructing a sheet of material for transferring heat from a shield of a component in accordance with some embodiments of the invention. Process 1000 can begin at step 1002. At step 1004, several layers of material can be combined to form a sheet. For example, layers of adhesive, graphite, and an external material can be combined to form a sheet. At step 1006, a shape can be stamped into the sheet. For example, a stamp corresponding to a shape of a shield or of a shield lid can be used to cut away a portion of the sheet. In some cases, a stamp having several shapes can be used to cut away several shapes from a single sheet. At step 1008, holes or other discontinuities can be provided in the sheet along at least one edge at which the sheet is folded. For example, a sequence of holes can be provided along a line in the sheet around which the sheet will be folded (e.g., where the sheet will fold to adhere to a top surface and to a tab of a shield lid). The holes can be provided using any suitable approach including, for example, stamping, drilling, laser cutting or any other such approach. Process 1000 can then end at step 1010.

FIG. 11 is a flowchart of an illustrative process for adhering a sheet to a shield in accordance with some embodiments of the invention. Process 1100 can begin at step 1102. At step 1104, a sheet of material having a sequence of holes can be provided. For example, a sheet constructed using process 1000 (FIG. 10) can be provided. At step 1106, the sheet may be positioned over a shield such that the holes in the sheet are aligned with an edge of a shield. For example, the sheet may be positioned such that holes that facilitate the bending of the sheet are aligned with an edge of a shield lid from which tabs extend. At step 1108, the sheet may be adhered to the shield. For example, an adhesive layer of the sheet may be secured to the shield lid. Process 1100 can then end at step 1110.

The above described embodiments of the present invention are presented for purposes of illustration and not of limitation, and the present invention is limited only by the claims which follow.

What is claimed is:

1. A board assembly, comprising:
  - a fence coupled to a circuit board, the fence forming a perimeter extending from the circuit board;
  - a lid comprising a planar surface and at least one tab extending from the planar surface at an edge, wherein the lid is placed over the fence such that the at least one tab engages the fence; and
  - a sheet of heat-transferring material disposed over the planar surface and the at least one tab, wherein the sheet has a plurality of holes extending through the sheet and aligned with the edge.
2. The board assembly of claim 1, wherein:
  - the fence defines a closed loop.
3. The board assembly of claim 2, wherein:
  - at least one component is coupled to the circuit board within the region enclosed by the fence.
4. The board assembly of claim 1, wherein the sheet further comprises:
  - a graphite layer; and
  - an adhesive layer, wherein the adhesive layer is positioned between the graphite layer and the lid.
5. The board assembly of claim 4, wherein the sheet further comprises:

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a plastic layer; and  
 a second adhesive layer, wherein the second adhesive layer is positioned between the graphite layer and the plastic layer.

6. The board assembly of claim 1, wherein the plurality of holes further comprise:

a sequence of holes evenly distributed along the edge.

7. The board assembly of claim 1, wherein the plurality of holes further comprise:

a plurality of circular holes.

8. The board assembly of claim 1, wherein the plurality of holes further comprise:

a plurality of slots.

9. Apparatus, comprising:

a circuit board;

a component on the circuit board;

an electromagnetic interference shielding structure that covers the component; and

a heat-transferring sheet having at least one discontinuity that facilitates bending along the discontinuity to align with an edge of the electromagnetic interference shielding structure, wherein the heat-transferring sheet comprises:

a first adhesive layer that is coupled to the electromagnetic interference shielding structure;

a layer of graphite on the first adhesive layer;

a second adhesive layer on the layer of graphite; and

an external layer over the second adhesive layer.

10. The apparatus defined in claim 9 wherein the external layer comprises a plastic layer.

11. The apparatus defined in claim 9 wherein the at least one discontinuity of the heat-transferring sheet is formed from a plurality of holes extending through each of the first adhesive layer, the graphite layer, the second adhesive layer, and the external layer.

12. The apparatus defined in claim 9 wherein the at least one discontinuity of the heat-transferring sheet is formed from an opening in only the graphite layer.

13. The apparatus defined in claim 9 wherein the electromagnetic interference shielding structure comprises:

a fence; and

a lid having a planar surface that covers the fence, wherein the lid includes tab portions that extend perpendicularly from the planar surface and are secured to the fence.

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14. The apparatus defined in claim 9 wherein the second adhesive layer and the external layer cover the planar surface and the tab portions of the lid and wherein the first adhesive layer and the layer of graphite cover only the planar surface of the lid.

15. The apparatus defined in claim 9 further comprising:

an additional component that is adjacent to the component, wherein at least part of the heat-transferring sheet is interposed between the tab portions of the lid and the additional component and prevents the tabs portions from damaging the additional component.

16. The apparatus defined in claim 9 wherein the circuit board has first and second opposing surfaces, wherein the component comprises a first component mounted on the first surface of the circuit board, the apparatus further comprising:

a second component mounted on the second surface of the circuit board, wherein the heat-transferring sheet comprises a U-shaped sheet that covers the first component on the first surface of the circuit board and the second component on the second surface of the circuit board.

17. The apparatus defined in claim 9 wherein the heat-transferring sheet encloses the component.

18. Apparatus, comprising:

a circuit board;

a component on the circuit board;

a fence on the circuit board around the component; a lid having a planar portion and at least one tab portion that extends from the planar portion at an edge and is coupled to the fence; and

a graphite layer that covers the planar portion at the at least one tab portion of the lid, wherein openings in the graphite sheet facilitate bending at the edge between the planar portion and the tab portion of the lid.

19. The apparatus defined in claim 18 wherein the graphite layer forms part of a heat-transferring sheet that comprises: a first adhesive layer that is coupled to the lid, wherein the graphite layer is on the first adhesive layer; a second adhesive layer on the graphite layer; and an external layer of the heat-transferring sheet that is on the second adhesive layer.

20. The apparatus defined in claim 19 wherein the fence and the lid shield the component from electromagnetic interference.

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